




Has climate change hijacked the environmental agenda?

Cássio Cardoso Pereira¹, Daniel Negreiros², Milton Barbosa³, Fernando Figueiredo Goulart²,
Rodrigo de Loyola Dias¹, Maria Clara Melillo¹, Flávio Camarota¹, Mariana Antunes Pimenta¹,
Marina Cruz¹, Geraldo Wilson Fernandes^{1,2}

¹ Programa de Pós-Graduação em Ecologia, Conservação e Manejo da Vida Silvestre, Departamento de Genética, Ecologia e Evolução, Universidade Federal de Minas Gerais, 31270-901, Belo Horizonte, Minas Gerais, Brazil

² Knowledge Center for Biodiversity, 31270-901, Belo Horizonte, MG, Brazil

³ Environmental Change Institute, School of Geography and the Environment, University of Oxford, South Parks Road, Oxford, OX1 3QY, UK

Corresponding author: Cássio Cardoso Pereira (cassiocardosopereira@gmail.com)

Abstract

Since the establishment of the Intergovernmental Panel on Climate Change (IPCC), decision-makers have realised that periodic assessments were needed to closely monitor climate change. Studies on it became widespread and include the science of greenhouse gas emissions, the composition of these gases and the extent to which humans have been responsible for climate change. In this sense, the United Nations summit has made significant progress since the Rio Conference (Eco 92), with the creation of the Conference of the Parties (COPs). However, governments should not solely focus on curbing greenhouse gas emissions into the atmosphere. In a society with broad and deep environmental problems, governments, the private sector and non-governmental organisations' (NGOs) efforts should include biodiversity conservation in their agenda. Solving a single problem, the climate crisis is honourable and urgently needed, but to constrain our ever-increasing land-use footprints on the planet needs the tackling of another equally challenging problem, the loss of biodiversity. The destruction of ecosystems undermines nature's ability to regulate greenhouse gas emissions and protect against extreme weather, thus accelerating climate change and increasing our vulnerability to it. Therefore, tackling environmental challenges means more than building electric cars, investing in "clean" energy and imposing fines on those who burn forests. To save the environment, scientists, industry, policy-makers and the wider society urgently need to look at other aspects of ecosystem conservation and restoration in the same way they look at the climate agenda.

Key words: Biodiversity crisis, climate change, Conference of the Parties, COP Bio, COP Climate, environmental agenda, global warming, integrated management



Academic editor: Klaus Henle

Received: 10 August 2023

Accepted: 21 August 2023

Published: 5 September 2023

ZooBank: <https://zoobank.org/B8C1DA5A-EFF8-46CA-944A-4507AC445DDB>

Citation: Pereira CC, Negreiros D, Barbosa M, Goulart FF, Dias RL, Melillo MC, Camarota F, Pimenta MA, Cruz M, Fernandes GW (2023) Has climate change hijacked the environmental agenda? Nature Conservation 53: 157–164. <https://doi.org/10.3897/natureconservation.53.110961>

Copyright: © Cássio Cardoso Pereira et al. This is an open access article distributed under terms of the Creative Commons Attribution License (Attribution 4.0 International – CC BY 4.0).

Global change myopia

Since the establishment of the Intergovernmental Panel on Climate Change (IPCC), decision-makers have realised that periodic assessments were needed to closely monitor climate change (O'Brien 1990). Studies on it became widespread and include the science of greenhouse gas emissions, the composition of these gases and the extent to which humans have been responsible for climate change (Bloomfield and Steward 2022). In this sense, the United Nations

summit has made significant progress since the Rio Conference (Eco 92), with the creation of the Conference of the Parties (COPs) (Humphreys et al. 2019). However, governments should not solely focus on curbing greenhouse gas emissions into the atmosphere.

When we analyse the popularity and prestige of intergovernmental organisations created in favour of the environment, the IPCC completely overshadows the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) (Fig. 1A). When we analyse environmental treaties, this situation repeats itself. The United Nations Framework Convention on Climate Change (UNFCCC) is far better known than the Convention on Biological Diversity (CBD) (Fig. 1B). This is a reflection of increased public attention

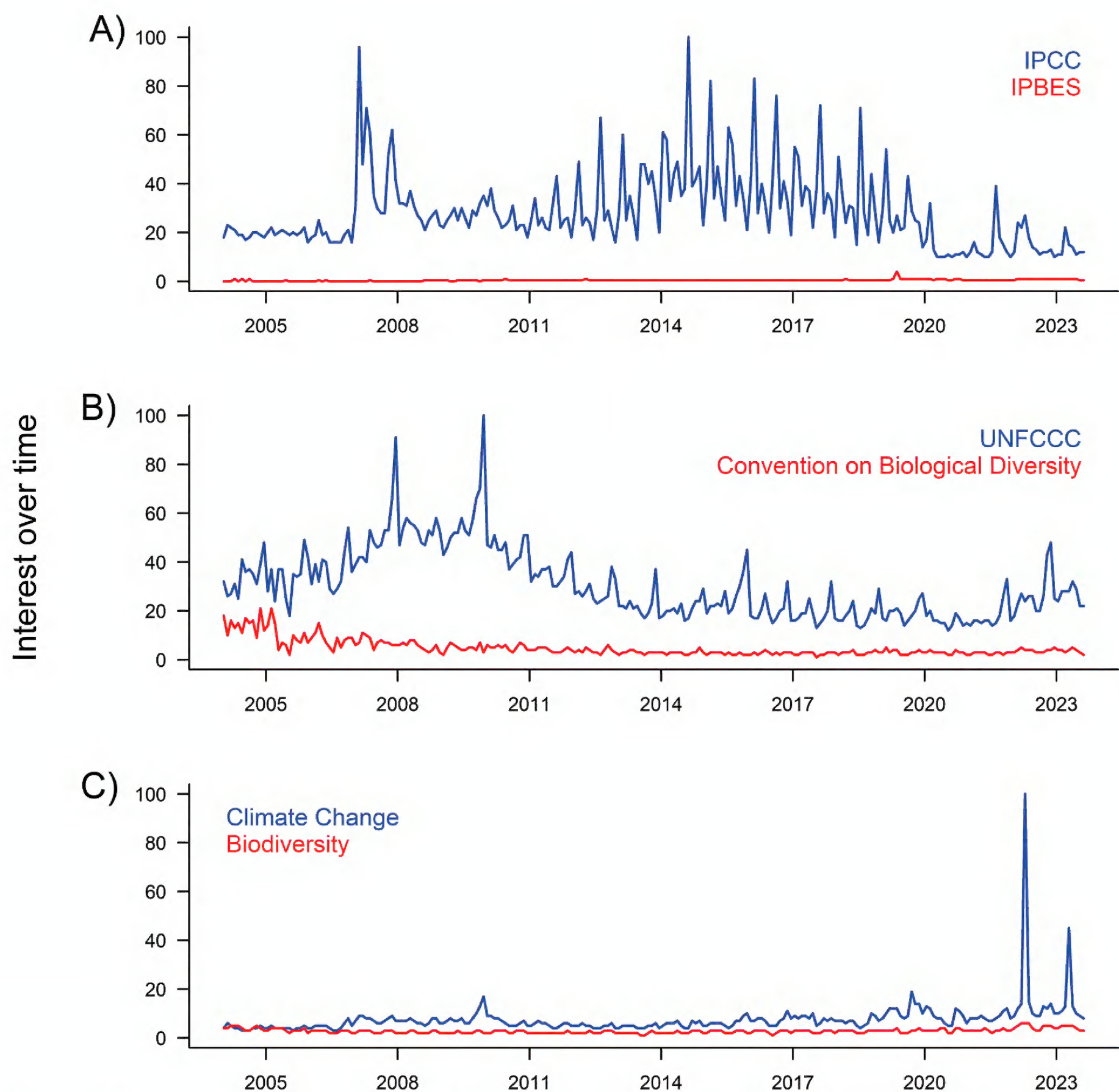


Figure 1. Web search interest for environmental topics around the world from 2004 to the present according to Google Trends™. Comparison of intergovernmental bodies (A), conventions (B) and terms (C) related to climate (blue) and biodiversity (red). Values represent the percentage of maximum (peak popularity). IPCC: Intergovernmental Panel on Climate Change; IPBES: Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services; UNFCCC: United Nations Framework Convention on Climate Change.

to climate change compared to other biodiversity issues (Hulme et al. 2018) (Fig. 1C) and may have contributed to a much higher number of COPs linked to climate change (27 COPs) relative to biodiversity (15 COPs) to this date. This asymmetry between environmental agendas can harm not only biodiversity, but also climate change, as environmental issues are inexorably interconnected (Rockström et al. 2021).

In a society with broad and deep environmental problems, governments, private sector and non-governmental organisations' (NGOs) efforts should include other dimensions of nature in their agenda (Chan et al. 2023; Schaubroeck 2023). Biodiversity, the unique variety of life on our planet, underpins our cultural, economic and social well-being (Cimatti et al. 2023). However, human-induced changes to ecosystems and the extinction of species have been more rapid in the past 50 years than at any time in human history (Cowie et al. 2022). Species are becoming extinct at about 1,000 times the average rate (Humphreys et al. 2019), as important habitats such as forests, wetlands, savannahs and coral reefs are plundered for human infrastructure (Torres et al. 2016). Soils are being deeply degraded (Ferreira et al. 2022), aquifers are being drained and polluted (Pereira and Fernandes 2022), corals are being bleached (Ainsworth et al. 2016), while fishing is being exploited at an unsustainable rate (Dulvy et al. 2021). The destruction of ecosystems undermines nature's ability to regulate greenhouse gas emissions and protect against extreme weather, further accelerating climate change and increasing vulnerability to it (Chan et al. 2022). Furthermore, around 50% of anthropogenic CO₂ emissions are removed by soil, vegetation and oceans each year, a free nature-based solution to climate change (Malhi et al. 2022). Therefore, it is puzzling that policy-makers are still over-focused on the climate component.

Challenges and perspectives

We argue here that climate change issue is an important and urgent matter; however, this problem must not be solved without considering the picture as a whole (Díaz et al. 2020). While many climate and biodiversity-friendly policies are aligned, as biomass accumulated by biodiverse ecosystems benefits both issues, some actions do not. The global carbon trade has been taken as an apple of the market's eye as a win-win solution that combines positive economic and environmental outputs. It is notable that, with some limitations, carbon trade has its climatic contribution (Xie et al. 2022). Nevertheless, plant biomass has much more to offer the world beyond acting as carbon sinks, as forests contribute to agriculture, medicine, energy and livelihoods for millions of people. As a consequence of this misguided focus on maintaining trees as carbon sinks, many tropical forests, savannahs and grasslands are being replaced by exotic *Pinus* or *Eucalyptus* monospecific stands for the sake of carbon sequestration (Veldman et al. 2015, 2019; Fernandes et al. 2016). In some tropical ecoregions, these plantations are amongst the major drivers of fragmentation, biodiversity and habitat loss, soil degradation and impact on non-climatic ecosystem services, such as water provision (Ricciardi et al. 2022). Finally, solar and wind farms from deforestation and bioenergy plantations (Seddon 2022), deep-sea mining for earth metals in energy batteries and photovoltaics (Lal and You 2023), and improper disposal of electric vehicle (EV) batteries (Lal and You

2023) are also harmful to biodiversity. Therefore, the climate agenda is unintentionally knocking down biodiversity conservation.

To fight climate change, we don't just depend on trees. Large animals aid climate change mitigation and adaptation through changes in fire regime, terrestrial albedo, increases in carbon stocks, trophic complexity, habitat heterogeneity, plant dispersal, resistance to abrupt change and microclimate modification (Johnson et al. 2018; Fricke et al. 2022; Malhi et al. 2022). We stress that if the fauna is not preserved, the populations of trees necessary for carbon sequestration will decrease (Fricke et al. 2022). Hunting mammals and birds, such as monkeys, tapirs and toucans, can reduce carbon storage in tropical forests (Fricke et al. 2022). This is because these animals spread the seeds of large trees, an important step for their reproduction (Galetti et al. 2013). Furthermore, the population decline of large grazing mammals may result in increased fires in savannahs, causing the release of CO₂ from ecosystems into the atmosphere (Johnson et al. 2018). It is also worth noting that preserved ecosystems act as natural buffers against extreme weather events, such as cyclones, floods and heat waves (Depietri et al. 2012). In this way, changes in land use must be integrated into climate models so that we can achieve a more detailed representation that increases our ability to predict how local impacts of change in land use will affect the future of biodiversity at a global level (Titeux et al. 2017).

Solving a single problem, the climate crisis, is honourable and urgently needed, but to constrain our ever-increasing land-use footprints on the planet needs the tackling of another equally challenging problem, the loss of biodiversity (Smith et al. 2022; Pörtner et al. 2023). Despite all the complexity of mitigating the climate change that we have been facing for decades, it can be contained, especially if there is enough biodiversity to purify the atmosphere and store carbon (Rockström et al. 2021; Sha et al. 2022). Finally, we emphasise that this path is necessary, but it is still winding. There is much to pass on to society in terms of ecological awareness (Peter et al. 2021). The spotlight is on climate change, at least in part, because climate action is something everyone already knows how to get involved in an accessible way. People can take simple steps to reduce emissions, for example, by watching their energy use or choosing to ride a bicycle instead of using a car. In addition, everyone can feel that the temperature is rising. However, the degradation of biodiversity can be difficult to notice (e.g. Régnier et al. 2009), especially for someone who does not get out and experience nature regularly. For example, not everyone in a city will notice that there are fewer bird species flying in an urban park. Therefore, a big question is how much we still have to learn about the various ecosystems around the planet, their delicate balance and interaction with their wider environment and indeed the climate (Mastrángelo et al. 2019).

Conclusion

Tackling environmental challenges means more than building electric cars, investing in “clean” energy and imposing fines on those who burn forests. To save the environment, scientists, industry, policy-makers and the wider society urgently need to look at other aspects of ecosystem conservation and restoration in the same way they look at the climate agenda.

Acknowledgements

The authors thank UFMG, PPG-ECMVS, CNPq, Fapemig and CAPES for their continuous support.

Additional information

Conflict of interest

The authors have declared that no competing interests exist.

Ethical statement

No ethical statement was reported.

Funding


Cássio Cardoso Pereira thanks Coordenação de Aperfeiçoamento de Pessoal de Nível Superior – Brazil (CAPES) – Finance Code 001. G. Wilson Fernandes thanks Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq) and Fundação de Amparo à Pesquisa do Estado de Minas Gerais (FAPEMIG) for grant support.

Author contributions

Cássio Cardoso Pereira, Daniel Negreiros, Rodrigo Dias and G. Wilson Fernandes conceived the ideas; Cássio Cardoso Pereira, Daniel Negreiros and G. Wilson Fernandes led the writing of the manuscript; Rodrigo Dias made the figure. All authors contributed critically to the drafts and gave final approval for publication.

Author ORCIDs

Cássio Cardoso Pereira  <https://orcid.org/0000-0002-6017-4083>

Daniel Negreiros  <https://orcid.org/0000-0002-4780-2284>

Milton Barbosa  <https://orcid.org/0000-0003-4243-7895>

Fernando Figueiredo Goulart  <https://orcid.org/0000-0002-6327-5285>

Rodrigo de Loyola Dias  <https://orcid.org/0000-0003-2224-4834>

Maria Clara Melillo  <https://orcid.org/0009-0008-1778-4661>

Flávio Camarota  <https://orcid.org/0000-0003-4452-7755>

Mariana Antunes Pimenta  <https://orcid.org/0000-0001-8764-5319>

Marina Cruz  <https://orcid.org/0000-0001-6468-5609>

Geraldo Wilson Fernandes  <https://orcid.org/0000-0003-1559-6049>

Data availability

All of the data that support the findings of this study are available in the main text.

References

- Ainsworth TD, Heron SF, Ortiz JC, Mumby PJ, Grech A, Ogawa D, Eakin CM, Leggat W (2016) Climate change disables coral bleaching protection on the Great Barrier Reef. *Science* 352(6283): 338–342. <https://doi.org/10.1126/science.aac7125>
- Bloomfield J, Steward F (2022) Strategies for Climate Change Post COP26. *The Political Quarterly* 93(2): 278–287. <https://doi.org/10.1111/1467-923X.13125>
- Chan S, Bauer S, Betsill MM, Biermann F, Boran I, Bridgewater P, Bulkeley H, Bustamente MMC, Deprez A, Dodds F, Hoffmann M, Hornidge A-K, Hughes A, Imbach P, Ivanova M,

- Köberle A, Kok MTJ, Lwasa S, Morrison T, Pörtner H-O, Sari AP, VanDeveer SD, Vollmer D, Widerberg O, Pettorelli N (2023) The global biodiversity framework needs a robust action agenda. *Nature Ecology & Evolution* 7(2): 172–173. <https://doi.org/10.1038/s41559-022-01953-2>
- Cimatti M, Chaplin-Kramer R, Di Marco M (2023) The role of high-biodiversity regions in preserving Nature's Contributions to People. *Nature Sustainability* 13: 1–9. <https://doi.org/10.1038/s41893-023-01179-5>
- Cowie RH, Bouchet P, Fontaine B (2022) The Sixth Mass Extinction: Fact, fiction or speculation? *Biological Reviews of the Cambridge Philosophical Society* 97(2): 640–663. <https://doi.org/10.1111/brv.12816>
- Depietri Y, Renaud FG, Kallis G (2012) Heat waves and floods in urban areas: A policy-oriented review of ecosystem services. *Sustainability Science* 7(1): 95–107. <https://doi.org/10.1007/s11625-011-0142-4>
- Díaz S, Zafra-Calvo N, Purvis A, Verburg PH, Obura D, Leadley P, Chaplin-Kramer R, De Meester L, Dulloo E, Martín-López B, Shaw MR, Visconti P, Broadgate W, Bruford MW, Burgess ND, Cavender-Bares J, DeClerck F, Fernández-Palacios JM, Garibaldi LA, Hill SLL, Isbell F, Khoury CK, Krug CB, Liu J, Maron M, McGowan PJK, Pereira HM, Reyes-García V, Rocha J, Rondinini C, Shannon L, Shin Y-J, Snelgrove PVR, Spehn EM, Strasburg B, Subramanian SM, Tewksbury JJ, Watson JEM, Zanne AE (2020) Set ambitious goals for biodiversity and sustainability. *Science* 370(6515): 411–413. <https://doi.org/10.1126/science.abe1530>
- Dulvy NK, Pacoureau N, Rigby CL, Pollom RA, Jabado RW, Ebert DA, Finucci B, Pollock CM, Cheok J, Derrick DH, Herman KB, Sherman CS, VanderWright WJ, Lawson JM, Walls RHL, Carlson JK, Charvet P, Bineesh KK, Fernando D, Ralph GM, Matsushiba JH, Hilton-Taylor C, Fordham SV, Simpfendorfer CA (2021) Overfishing drives over one-third of all sharks and rays toward a global extinction crisis. *Current Biology* 31(21): 4773–4787.e8. <https://doi.org/10.1016/j.cub.2021.08.062>
- Fernandes GW, Coelho MS, Machado RB, Ferreira ME, Aguiar LMDS, Dirzo R, Scariot A, Lopes CR (2016) Afforestation of savannas: An impending ecological disaster. *Natureza & Conservação* 14(2): 146–151. <https://doi.org/10.1016/j.ncon.2016.08.002>
- Ferreira CSS, Seifollahi-Aghmiuni S, Destouni G, Ghajarnia N, Kalantari Z (2022) Soil degradation in the European Mediterranean region: Processes, status and consequences. *The Science of the Total Environment* 805: 150106. <https://doi.org/10.1016/j.scitotenv.2021.150106>
- Fricke EC, Ordonez A, Rogers HS, Svenning J-C (2022) The effects of defaunation on plants' capacity to track climate change. *Science* 375(6577): 210–214. <https://doi.org/10.1126/science.abk3510>
- Galetti M, Guevara R, Côrtes MC, Fadini R, Von Matter S, Leite AB, Labecca F, Ribeiro T, Carvalho CS, Collevatti RG, Pires MM, Guimarães Jr PR, Brancalion PH, Ribeiro MC, Jordano P (2013) Functional extinction of birds drives rapid evolutionary changes in seed size. *Science* 340(6136): 1086–1090. <https://doi.org/10.1126/science.1233774>
- Hulme M, Obermeister N, Randalls S, Borie M (2018) Framing the challenge of climate change in Nature and Science editorials. *Nature Climate Change* 8(6): 515–521. <https://doi.org/10.1038/s41558-018-0174-1>
- Humphreys AM, Govaerts R, Ficinski SZ, Nic Lughadha E, Vorontsova MS (2019) Global dataset shows geography and life form predict modern plant extinction and rediscovery. *Nature Ecology & Evolution* 3(7): 1043–1047. <https://doi.org/10.1038/s41559-019-0906-2>

- Johnson CN, Prior LD, Archibald S, Poulos HM, Barton AM, Williamson GJ, Bowman DMJS (2018) Can trophic rewilding reduce the impact of fire in a more flammable world? *Philosophical Transactions of the Royal Society B: Biological Sciences* 373(1761): 20170443. <https://doi.org/10.1098/rstb.2017.0443>
- Lal A, You F (2023) Will reshoring manufacturing of advanced electric vehicle battery support renewable energy transition and climate targets? *Science Advances* 9(24): eadg6740. <https://doi.org/10.1126/sciadv.adg6740>
- Malhi Y, Lander T, Le Roux E, Stevens N, Macias-Fauria M, Wedding L, Girardin C, Kristensen JÅ, Sandom CJ, Evans TD, Svenning J-C, Canney S (2022) The role of large wild animals in climate change mitigation and adaptation. *Current Biology* 32(4): R181–R196. <https://doi.org/10.1016/j.cub.2022.01.041>
- Mastrángelo ME, Pérez-Harguindeguy N, Enrico L, Bennett E, Lavorel S, Cumming GS, Abeygunawardane D, Amarilla LD, Burkhard B, Egoh BN, Frishkoff L, Galetto L, Huber S, Karp DS, Ke A, Kowaljow E, Kronenburg-García A, Locatelli B, Martín-López B, Meyfroidt P, Mwampamba TH, Nel J, Nicholas KA, Nicholson C, Oteros-Rozas E, Rah-lao SJ, Raudsepp-Hearne C, Ricketts T, Shrestha UB, Torres C, Winkler KJ, Zoeller K (2019) Key knowledge gaps to achieve global sustainability goals. *Nature Sustainability* 2(12): 1115–1121. <https://doi.org/10.1038/s41893-019-0412-1>
- O'Brien BJ (1990) IPCC's climate change mindset. *Nature* 348(6296): 9–9. <https://doi.org/10.1038/348009a0>
- Pereira CC, Fernandes GW (2022) Cerrado conservation is key to the water crisis. *Science* 377(6603): 270–270. <https://doi.org/10.1126/science.add4719>
- Peter M, Diekötter T, Höffler T, Kremer K (2021) Biodiversity citizen science: Outcomes for the participating citizens. *People and Nature* 3(2): 294–311. <https://doi.org/10.1002/pan3.10193>
- Pörtner H-O, Scholes RJ, Arneth A, Barnes DKA, Burrows MT, Diamond SE, Duarte CM, Kiessling W, Leadley P, Managi S, McElwee P, Midgley G, Ngo HT, Obura D, Pascual U, Sankaran M, Shin YJ, Val AL (2023) Overcoming the coupled climate and biodiversity crises and their societal impacts. *Science* 380(6642): eabl4881. <https://doi.org/10.1126/science.abl4881>
- Régnier C, Fontaine B, Bouchet P (2009) Not knowing, not recording, not listing: Numerous unnoticed mollusk extinctions. *Conservation Biology* 23(5): 1214–1221. <https://doi.org/10.1111/j.1523-1739.2009.01245.x>
- Ricciardi L, D'Odorico P, Galli N, Chiarelli DD, Rulli MC (2022) Hydrological implications of large-scale afforestation in tropical biomes for climate change mitigation. *Philosophical Transactions of the Royal Society B: Biological Sciences* 377(1857): 20210391. <https://doi.org/10.1098/rstb.2021.0391>
- Rockström J, Beringer T, Hole D, Griscom B, Mascia MB, Folke C, Creutzig F (2021) We need biosphere stewardship that protects carbon sinks and builds resilience. *Proceedings of the National Academy of Sciences of the United States of America* 118(38): e2115218118. <https://doi.org/10.1073/pnas.2115218118>
- Schaubroeck T (2023) IPCC: Expand into a panel on sustainability. *Nature* 616(7958): 661–661. <https://doi.org/10.1038/d41586-023-01392-4>
- Seddon N (2022) Harnessing the potential of nature-based solutions for mitigating and adapting to climate change. *Science* 376(6600): 1410–1416. <https://doi.org/10.1126/science.abn9668>
- Sha Z, Bai Y, Li R, Lan H, Zhang X, Li J, Liu X, Chang S, Xie Y (2022) The global carbon sink potential of terrestrial vegetation can be increased substantially by optimal

- land management. *Communications Earth & Environment* 3(1): 1–10. <https://doi.org/10.1038/s43247-021-00333-1>
- Smith P, Arneeth A, Barnes DKA, Ichii K, Marquet PA, Popp A, Pörtner H, Rogers AD, Scholes RJ, Strassburg B, Wu J, Ngo H (2022) How do we best synergize climate mitigation actions to co-benefit biodiversity? *Global Change Biology* 28(8): 2555–2577. <https://doi.org/10.1111/gcb.16056>
- Titeux N, Henle K, Mihoub J-B, Regos A, Geijzendorffer IR, Cramer W, Verburg PH, Brotons L (2017) Global scenarios for biodiversity need to better integrate climate and land use change. *Diversity & Distributions* 23(11): 1231–1234. <https://doi.org/10.1111/ddi.12624>
- Torres A, Jaeger JAG, Alonso JC (2016) Assessing large-scale wildlife responses to human infrastructure development. *Proceedings of the National Academy of Sciences of the United States of America* 113(30): 8472–8477. <https://doi.org/10.1073/pnas.1522488113>
- Veldman JW, Overbeck GE, Negreiros D, Mahy G, Le Stradic S, Fernandes GW, Durigan G, Buisson E, Putz FE, Bond WJ (2015) Tyranny of trees in grassy biomes. *Science* 347(6221): 484–485. <https://doi.org/10.1126/science.347.6221.484-c>
- Veldman JW, Aleman JC, Alvarado ST, Anderson TM, Archibald S, Bond WJ, Boutton TW, Buchmann N, Buisson E, Canadell JG, Dechoum MDS, Diaz-Toribio MH, Durigan G, Ewel JJ, Fernandes GW, Fidelis A, Fleischman F, Good SP, Griffith DM, Hermann J-M, Hoffmann WA, Le Stradic S, Lehmann CER, Mahy G, Nerlekar AN, Nippert JB, Noss RF, Osborne CP, Overbeck GE, Parr CL, Pausas JG, Pennington RT, Perring MP, Putz FE, Ratnam J, Sankaran M, Schmidt IB, Schmitt CB, Silveira FAO, Staver AC, Stevens N, Still CJ, Strömberg CAE, Temperton VM, Varner JM, Zaloumis NP (2019) Comment on “The global tree restoration potential”. *Science* 366(6463): eaay7976. <https://doi.org/10.1126/science.aay7976>
- Xie Q, Hao J, Li J, Zheng X (2022) Carbon price prediction considering climate change: A text-based framework. *Economic Analysis and Policy* 74: 382–401. <https://doi.org/10.1016/j.eap.2022.02.010>